SPECIFICATIONS FOR THE PURCHASE OF
Gas Chromatograph/Mass Selective Detector

PART 1— GENERAL

1.01 SUMMARY

A. Section includes for a GC/MSD: Gas Chromatograph/Mass Selective Detector for the Drug Chemistry Section

B. Work includes but is not limited to the following:

- Labor
- Equipment and material to order
- Receiving and installing the GC/MSD's as specified herein.

PART 2 — PRODUCTS

2.01 GC/MSD: GAS CHROMATOGRAPH/MASS SELECTIVE DETECTOR

A. Detailed specifications:

1. El SIM IDL (Helium carrier gas with Auto Liquid Sampler). Demonstrated at Install with Autosampler
   a. 10 fg or less for Inert Extractor EI source, Turbo Pump.
   b. 8 sequential 1 µL OFN standard solution at nominal 272 u ion. Demonstrated at install when sold with a Liquid Autosampler.

2. Helium (He) Electron Impact Sensitivity SCAN mode:
   a. Extractor 1 pg OFN gives >1500:1 S/N
   b. Scanning from 50-300 u at nominal m/z 272 ion demonstrated at install.

3. Ultra Inert Column of conventional size and Ultra Inert inlet liner.
   a. The installation check out column should be the conventional dimension (30m x 0.25MM I.D. x 0.25um) Ultra Inert Column, which the Manufacture offers the MS library for major GC/MS applications using that column.
   b. The inlet liner should be Ultra inert for demonstration of installation check out.
4. Detector Type
   a. The Mass Spectrometer's detector shall be a Triple-Axis HED-EM, which places the HED-EM doubly off-axis from the axis of the transmission

quadrupole.

5. Accessibility to Mass Filter
    a. The Mass Filter and Detector should be placed on the same plate as Ion Source for better accessibility.
6. Trace Ion Detection (TID)
    a. The proprietary electric noise reductions of scan MS data to improve the quality of mass spectrum.
7. Gain Normalization Autotune
    a. The Mass Spectrometer must have a Gain Normalized Autotune which optimizes the EM's gain to ensure the optimal balance between ion count, linearity and EM life expectancy.
8. Scan Rate
    a. The Mass Spectrometer shall have an electronic scan rate of 20,000 u/sec.
9. Inert source.
    a. The mass spectrometer must use an ion source where the metallic parts are constructed from inert material. Ion Source temp controllable from 100-350 degrees C. Stainless steel is NOT acceptable nor is coating the metallic parts with an inert material.
10. Monolithic quartz structure, hyperbolic form quadrupole.
    a. The mass spectrometer must utilize a Quadrupole Mass Filter consisting of a monolithic quartz structure. A quadrupole consisting of 4 separate rods is NOT acceptable. The rods must have a true hyperbolic shape in keeping with quadrupole theory. The Quadrupole is to be independently heated and its temperature is to be user-selectable from 100 - 200°C.
11. Gold and titanium multilayer metalized hyperbolic electrode surfaces.
    a. The quadrupole is to have its electrode surfaces covered by titanium composite and gold thin and thick films.
12. Mass Range
    a. The instrument must scan from 1.6 to 1050 u.
13. SIM Capacity
    a. The mass spectrometer shall have the capability to create 100 SIM ion groups with up to 60 ions per group.
14. SIM Speed
    a. Down to 0.1 msec.
15. High Performance Synchronous SIM/Scan
    a. The mass spectrometer's electronics must have the efficiency to support synchronous SIM/Scan. Synchronous SIM/Scan is a mode of operation that enables collection of both SIM data and full scan data in the same acquisition cycle. The fast electronics of the GC/MS system provides very fast and flexible SIM and Scan. SIM dwell times can be set in 1 msec increments from higher than 100 msec to as low as 1 msec dwell, allowing rapid analysis with more compounds and more samples.
16. Automated SIM setup
    a. The mass spectrometer must have an automated SIM setup that can convert a full scan method to a SIM or SIM/Scan method. The software

must automatically configure the number of SIM groups, SIM cycles across the peak, and the ions added to each group.

17. High Vacuum Pumping Speed
    a. The high-vacuum region must utilize an air-cooled high-vacuum turbo pump with a minimum pumping speed of 255 L/s (Helium) Turbo Pump with 2.5 m3/hr mechanical pump.
18. Max column flow rate for data acquisition (for optimal chromatography and sensitivity flow should be between 1 and 2 ml/min in EI and 2 and 4 in CI-Higher flow are used on mega bore column, not useable for Trace analysis and/or fast chromatography).
    a. 4 mL/min for turbo pump.
19. Recommended maximum sustained column flow to MS. a. 50 ml./min
20. Local User Interface
    a. The Mass Spectrometer is to have a Local User Interface (LUSI) with only six keys, a 3 lines display and additional 1 line for MS status so that local control of the instrument can be achieved while the mass spectrometer's data system is remotely located.
21. Retention Time-Locking Software
    a. The mass spectrometer data system must have an integrated retention time-locking module for analyzing target compounds in complex matrices. The software module must provide the creation of custom compound databases as well as the utilization of vendor provided databases. Vendor databases include: pesticides and endocrine disruptors; PCB's; VOC's; Fatty Acid Methyl Esters; Drugs of Abuse and Flavors and Fragrances.
22. Sleep/Wake Mode (GC and MSD)
    a. The Gas Chromatograph must have clock time programmability to allow a user to have the instrument come on at a specified time, and be at operating temperature and stable when use is required. This will also allow the use to program automated shutdown times. An example of using this feature: Friday 6:45pm - shut down system, Monday 6:30am - bring system back on line. Sleep/Wake mode should also be available on MSD for power saving. When GC goes to Sleep Mode, MSD also goes to power saving mode for reduction of electric power consumption.(7890B-5977A only).
23. Sequence actions
    a. Tuning MS, Sleep/Wake, etc., are available as the actions of Sequence.
24. Fast venting
    a. When Vent Cycle is started, GC recognizes and optimizes the column flow to cool down the MSD faster.
25. Multiple instrument and detector control and acquisition.
    a. The MS data system must be capable of controlling 2 complete GC/MSD systems.

2.03 MASS SPECTROMETER

A. The Mass Spectrometer, which is to be interlaced with the gas chromatograph, auto sampler and data system.

B. Detailed specifications:

1. Ambient temperature and pressure compensation
    a. The Gas Chromatograph must have ambient temperature and pressure compensation feedback for electronic pneumatic control for all inlets and detectors.
2. Auxiliary EPC modules
    a. The Gas Chromatograph must have an Optional 3 channel module of auxiliary EPC to be used for flow control of external sampling devices such as a thermal desorber shall be available.
3. Gas Phase Microfluidics capability
    a. The Gas Chromatograph must have available a Gas Phase microfluidics capability to provide automated Dean's Switching, effluent splitting between the mass spectrometer and another detector or the ability to change the column without venting the mass spectrometer.
4. Hydrogen Safety
    a. The Gas Chromatograph must have a hydrogen safety shutdown system that monitors the hydrogen flow and shuts down the gas flows and heaters if a leak is detected.
    b. The Gas Chromatograph should have oven explosion protection built into the oven door. The Mass Spectrometer should not fragmentize in the event of a hydrogen deflagration.
5. Method Optimizer
    a. The Gas Chromatograph method parameter (column size, carrier gas type, etc.) translation function for optimizing the parameter should be built in the Software Package. The calculated result should be transferred to method for analysis.

C. Nothing in the detailed specifications shall be intended or perceived as excluding any manufacturer provided they meet or exceed the specifications.